

sented nothing of special interest. Lower stages were the rule, except in the Willamette and the Sacramento rivers on the Pacific coast, where the rains of the last week of the month caused a moderate rise.

Running ice was reported in the Mississippi River as follows: St. Paul, Minn., on the 18th and 19th, and from the 24th to the 28th, inclusive; La Crosse, Wis., from the 17th to the 19th, inclusive; and Dubuque, Iowa, on the 16th. On this date the ice harbor at Dubuque was also frozen over.

The Missouri River at Bismarck, N. Dak., froze over on the 7th, closing navigation for a time. There was no ice at the end of the month, although the river was frozen both above and below the city. At Pierre, S. Dak., there was running ice from the 15th to the 25th, inclusive, but not in sufficient quantities to necessitate the closing of navigation. The Red

River of the North froze over at Moorhead, Minn., except at the bridges. In the Susquehanna River, at Wilkesbarre, Pa., the first ice was seen on the 28th; while in the Hudson, it appeared in such quantities as to compel the closing of navigation on the 30th.

The highest and lowest water, mean stage, and monthly range at 135 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport on the Red.—*H. C. Frankenfeld, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau.

[Temperature is expressed in degrees Fahrenheit and precipitation in inches and hundredths.]

Alabama.—The mean temperature was 48.8°, or 4.6° below normal; the highest was 84°, at Bermuda, Eutaw, and Tuskegee on the 2d, and the lowest, 16°, at Scottsboro on the 16th and at Ashville on the 17th. The average precipitation was 1.85, or 1.38 below normal; the greatest monthly amount, 5.14, occurred at Uniontown, and the least, 0.17, at Cordova.

Conditions favorable for gathering late crops, but only moderately favorable for sowing and germination of fall grains; first killing frost of the season occurred very generally in north-central and northern counties on 5th or 6th, and throughout the rest of the State on the 16th or 17th.—*F. P. Chaffee.*

Arizona.—The mean temperature was 57.1°, or 5.0° above normal; the highest was 94°, at Sentinel and at Signal on the 1st and other dates, and the lowest, 14°, at Flagstaff on 18th and at Fort Defiance on 14th and 27th. The average precipitation was 0.32, or 0.34 below normal; the greatest monthly amount, 1.40, occurred at Prescott, while none fell at a great number of stations.

The principal farming operations of the season are plowing and seeding. The work is very backward on account of the dry and hard condition of the soil, owing to lack of rainfall and a deficient supply of water for irrigation. The gathering of the orange crop was begun the latter part of the month. The yield is below the average.—*Wm. G. Burns.*

Arkansas.—The mean temperature was 50.5°, or about normal; the highest was 88°, at Camden on the 2d, and the lowest, 15°, at Pond on the 16th. The average precipitation was 2.99, or 0.81 below normal; the greatest monthly amount, 4.83, occurred at Mossville, and the least, 1.57, at Corning.

The weather during the month has been generally favorable for wheat; the early sown has generally come up to good stands and looks healthy and vigorous. In some localities the stands are not so good, having been injured by the hessian fly and other insects and the drought. The late sown is much better; the timely rains have been of great benefit and have given it a good start. There have been no severe freezes or frosts sufficiently heavy to damage it. Fall oats and rye are generally up to good stands and are looking well.—*Edward B. Richards.*

California.—The mean temperature was 54.9°, or 2.5° above normal; the highest was 100°, at Craftonville on the 6th, and the lowest, 5°, at Bodie on the 11th. The average precipitation was 2.65, or 0.46 above normal; the greatest monthly amount, 12.85, occurred at Upper Mattole, while none fell at ten stations.

Conditions were favorable for farming operations; no injurious frosts occurred. The rainfall was slightly in excess of the normal, particularly in the central and northern sections, but was deficient in southern California. The rain was very beneficial to early sown grain and pasture, and caused but little damage to late fall crops.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 40.0°, or 4.8° above normal; the highest was 88°, at Holyoke on the 4th, and the lowest, 3° below zero, at Moraine on the 19th and at Breckenridge on the 12th and 25th. The average precipitation was 0.22, or about one-fourth the normal

amount; the greatest monthly amount, 1.60, occurred at Ruby, while none fell at a number of stations.—*F. H. Brandenburg.*

Cuba.—The mean temperature was 72.2°; the highest was 95°, at San Cayetano on the 8th, and the lowest, 40°, at Central Rosario (Aguacate) on the 22d. The average precipitation was 0.83; the greatest monthly amount, 8.25, occurred at Central Sta. Lucia (Gibara), while none fell at numerous points in the provinces of Pinar del Rio, Havana, Matanzas, and Santa Clara.

The temperature was unusually uniform, but was generally below normal throughout the month. In Santiago de Cuba Province light rains fell with a fair degree of frequency, but over the remainder of the island extremely dry weather prevailed, and numerous localities of the western half of the island received no rain at all. During the first few days of the month both temperature and rainfall conditions were favorable for crops, but their continuance caused this season's cane crop to mature too early and retarded the growth of canes planted last spring and this fall; many tobacco seed beds were entirely ruined, and during the latter part of the month transplanting was impracticable, or was carried on under difficulties, except in those sections with irrigating facilities.—*Montrose W. Hayes.*

Florida.—The mean temperature was 59.1°, or 6.0° below normal; the highest was 90°, at Fort Meade on the 1st and at Hypoluxo on the 3d, and the lowest, 21°, at Wausau on the 17th. The average precipitation was 0.89, or 1.12 below normal; the greatest monthly amount, 2.22, occurred at Titusville, and the least, trace, at Flamingo.

The month was the coldest November since the establishment of the Climate and Crop Service, eleven years ago. Frosts and freezing conditions prevailed over the north half of the State and light frost occurred over the upper portion of the southern district. Considerable damage resulted to vegetables and sugar cane. The month was very dry, the deficiency in precipitation being such as to retard the growth of vegetables and strawberries. Oranges colored nicely and shipments were active.—*A. J. Mitchell.*

Georgia.—The mean temperature was 49.3°, or 5.0° below normal; the highest was 87°, at Fitzgerald and Maury on the 1st, and the lowest, 12°, at Greenbush on the 29th. The average precipitation was 0.98, or 1.80 below normal; the greatest monthly amount, 2.58, occurred at Columbus, and the least, 0.10, at Gillsville.

The mean temperature and the average rainfall were the lowest on record for the month during the past eleven years. The weather, although unseasonably cold, was pleasant and invigorating. Rain fell on an average of but four days, and at several stations there was but one day with precipitation. The conditions were unusually favorable for harvesting matured cotton and other late crops. The sowing of fall oats, fall wheat, and rye was retarded by excessive dryness of the soil. Frost formations were exceptionally heavy and numerous.—*J. B. Marbury.*

Idaho.—The mean temperature was 39.4°, or 3.4° above normal; the highest was 78°, at Payette on the 1st, and the lowest, 5°, at Forney on the 11th. The average precipitation was 1.19, or 0.68 below normal; the greatest monthly amount, 5.05, occurred at Murray, and the least, trace, at Blackfoot and Downey.

November was remarkable for excessive temperature and deficient precipitation. The snowfall was light, confined to the high mountains, and disappeared rapidly. October rains caused a fine growth of grass on the stock ranges. The mildness, together with absence of heavy snow, enabled stock to remain on the mountain ranges to within a few days of the close of the month.—*S. M. Blandford.*

Illinois.—The mean temperature was 38.7°, or 1.3° below normal; the highest was 81°, at Centralia on the 1st, and the lowest, 4°, at Dixon

on the 18th. The average precipitation was 1.32, or 1.41 below normal; the greatest monthly amount, 2.40, occurred at Tilden, and the least, 0.50, at Havana.

November was a rather dry month and excellent for carrying on fall and early winter farming operations. The dry weather was not, however, favorable for the germination and growth of fall-sown crops, though wheat is in fairly promising condition. The condition of rye is somewhat less promising. Meadows and pastures have suffered considerably from the heat of the past summer and the dry weather of both summer and fall, and they are generally in poor condition.—*M. E. Blystone.*

Indiana.—The mean temperature was 38.9°, or 2.6° below normal; the highest was 76°, at Mount Vernon on the 1st, and the lowest, 11°, at Hammond on the 5th and at Winamac on the 5th and 8th. The average precipitation was 1.30 or 2.29 below normal; the greatest monthly amount, 2.23, occurred at Hammond, and the least, trace, at Bedford.

Weather conditions were favorable for outdoor work and good progress was made in cribbing corn. The absence of rain was detrimental to growth of wheat and rye. Owing to dryness of ground and to avoid possible damage to plant by insects, much of the wheat was sown late, and the drought continuing, the seed germinated slowly. The plant is short, not well rooted, and the stand is uneven. Rye was sown earlier than wheat in most localities and its condition is fairly good. Pastures failed and stock feeding began earlier than usual.—*W. T. Blythe.*

Iowa.—The mean temperature was 35.8°, or 3.0° above normal; the highest was 77°, at Baxter on the 1st, and the lowest, 2°, at Decorah and Elkader on the 5th. The average precipitation was 0.86, or 0.56 below normal; the greatest monthly amount, 2.30, occurred at Lenox, and the least, 0.20, at Murray.

The month was warmer than usual, with more than the normal amount of clear weather, affording exceptionally favorable conditions for cribbing corn, plowing, and farm operations usual to the season. Some damage resulted to potatoes and late vegetables from severe cold snap of the 3d to 6th, but the balance of the month was not cold enough to retard field work; bulk of corn has been cribbed in fine order. Although the ground is rather dry the fall grain is in good condition to withstand the winter.—*John E. Sage.*

Kansas.—The mean temperature was 44.9°, or 3.6° above normal; the highest was 83°, at Sedan on the 24th, and the lowest, 10°, at Achilles and Colby on the 15th. The average precipitation was 0.65, or 0.20 below normal; the greatest monthly amount, 2.27, occurred at Columbus, while none fell at Coolidge, Garden, Lakin, and Scott.

Unusually warm, dry month, very favorable for outdoor work. Corn mostly cribbed. Apples all gathered, good crop. Wheat continued growing; most of it in fine condition; much in very fine condition and being pastured; much needing moisture at close of month; sowing not finished in the extreme west. Some plowing in southern counties, and some alfalfa being cut for hay.—*T. B. Jennings.*

Kentucky.—The mean temperature was 41.8°, or 3.9° below normal; the highest was 82°, at Greensburg on the 11th, and the lowest, 11°, at Bowling Green and Fords Ferry on the 17th. The average precipitation was 1.52, or 2.44 below normal; the greatest monthly amount, 2.41, occurred at Blandville, and the least, 0.10, at Franklin.

Cool, pleasant weather, with rainfall much below normal. In western portion of State about the usual acreage of winter wheat has been sown and it is in very good condition; in central and eastern portions acreage is low, and cool, dry weather has checked growth, leaving it in rather poor condition. Very little complaint of fly. Rye generally looks better. Tobacco cured nicely, but very little stripping has been done on account of dry weather. Fall grass good in west, but only fair in central and east portions. Stock in fair condition.—*H. B. Hersey.*

Louisiana.—The mean temperature was 56.3°, or 2.5° below normal; the highest was 91°, at Jeanerette on the 1st, 2d, and 3d, and the lowest, 24°, at Collinston on the 15th and Plain Dealing on the 16th. The average precipitation was 2.31, or 1.60 below normal; the greatest monthly amount, 5.61, occurred at Houma, and the least, 0.47, at Sugartown.

The weather during the greater part of the month was favorable for cotton picking. Heavy frost early in the month killed the top crop before it matured. The month opened with favorable weather for sugar cane, and conditions continued exceptionally propitious for this crop until on the 16th and 17th, when low temperatures occurred in the sugar region, with heavy frost to the coast line. Ice formed in exposed places in some of the coast parishes. The bud of the cane was killed generally, and in some localities two or three of the top joints were frozen. Windrowing, while not necessary, was resorted to as a matter of precaution. Cane worked up since the freeze does not show any deterioration. It appears to steadily increase in richness, and the yield of sugar per ton is becoming better and better. The results are generally satisfactory. Rice harvesting was completed in the western parishes, and thrashing nearly completed. The yield has been exceptionally heavy. The bulk of the corn crop has been housed, and the yield is much below the average. Plowing has progressed satisfactorily.—*I. M. Oline.*

Maryland and Delaware.—The mean temperature was 39.2°, or 5.5° below normal; the highest was 76°, at Milford, Del., on the 1st, and the lowest, 4°, at Sunnyside, Md., on the 29th. The average precipi-

tation was 2.68, or 0.45 below normal; the greatest monthly amount, 5.20, occurred at Sunnyside, Md., and the least, 1.43, at Cambridge, Md.

November was a cold, dry, and windy month, except that in the extreme west precipitation was ample. Snowfall was moderately heavy in the mountains, but light elsewhere. Over most of the section scarcely any rain fell until the 23d, when heavy amounts were of general occurrence. The moisture at this time greatly benefited wheat and grass, which were in bad condition, owing to a long dry spell that had lasted since the middle of October.—*Oliver L. Faessig.*

Michigan.—The mean temperature was 33.8°, or 1.7° below normal; the highest was 70°, at Plymouth on the 11th, and the lowest, 4° below zero, at Humboldt on the 5th. The average precipitation was 1.36, or 1.45 below normal; the greatest monthly amount, 4.72, occurred at Lathrop, and the least, 0.10, at Lincoln.

The weather conditions during November were too dry for the best growth of winter wheat, which at the end of the month was small, but healthy and well colored. The lack of precipitation dried up pastures quite rapidly, so that farmers were obliged to feed their stock; the dry conditions, however, were very favorable for corn husking and the delivery of sugar beets to the factories. Wheat seeding has averaged later than ever before, the late seeding being done to avoid the hessian fly; early winter wheat has some fly in it, but the later seeding seems to be affected very little.—*C. F. Schneider.*

Minnesota.—The mean temperature was 28.8°, or 1.0° above normal; the highest was 75°, at Currie on the 2d, and the lowest, 10° below zero, at Warroad on the 24th. The average precipitation was 0.78, or 0.20 below normal; the greatest monthly amount, 2.06, occurred at Two Harbors, and the least, trace, at Crookston and Moorhead.

Many of the lakes were closed by ice early in the month, but the deeper ones were not frozen over till later. There was considerable ice running down the Mississippi on the 15th, and on the 18th the river at Minneapolis was almost entirely frozen over above the falls. Work in the soil was stopped very soon after the beginning of the month by freezing weather, and the only farm work possible since then is that usually done in winter.—*T. S. Outram.*

Mississippi.—The mean temperature was 51.9°, or 3.3° below normal; the highest was 87°, at Poplarville on the 2d, and the lowest, 19°, at Ripley on the 17th. The average precipitation was 2.46, or 1.00 below normal; the greatest monthly amount, 4.22, occurred at Nittayuma, and the least, 1.15, at Okolona.

The month was very favorable for the completion of cotton picking and for fall seeding.—*W. S. Belden.*

Missouri.—The mean temperature was 43.4°, or 1.0° above normal; the highest was 84°, at Zeitonia on the 2d, and the lowest, 9°, at Hannibal on the 17th. The average precipitation was 1.37, or 1.09 below normal; the greatest monthly amount, 4.34, occurred at Mineralspring, and the least, 0.32, at Arthur. For the State, as a whole, it was the driest November during the past 17 years.

In most of the western counties wheat made good progress, and at the close of the month was in a very promising condition, but in nearly all of the central and eastern counties its growth was retarded by the dry weather. In general, however, the crop did well considering the light rainfall. Fall pastures afforded considerable feed in portions of the western and southern sections, but over the greater portion of the State they were very poor.—*A. E. Hackett.*

Montana.—The mean temperature was 36.7°, or 6.2° above normal; the highest was 79°, at Utica on the 27th, and the lowest, 3° below zero, at Culbertson on the 3d. The average precipitation was 0.59, or 0.46 below normal; the greatest monthly amount, 3.36, occurred at Troy, while none fell at Martinsdale.

The weather during the month was very mild, with the precipitation below the normal at all stations, except Fort Benton, Glasgow, Havre, and Poplar.—*E. J. Glass.*

Nebraska.—The mean temperature was 39.5°, or 4.6° above normal; the highest was 85°, at Madrid on the 10th, and the lowest, 8°, at Lynch on the 16th. The average precipitation was 0.50, or 0.17 below normal; the greatest monthly amount, 1.70, occurred at Laclede, while none fell at several places in the western portion of the State.

The high temperature, with sufficient moisture, has been very favorable for the growth of fall-sown grain and for completing fall work.—*G. A. Loveland.*

Nevada.—The mean temperature was 43.1°, or 4.4° above normal; the highest was 80° at Martins Ranch on the 5th, and lowest, 12°, at Owyhee on the 11th. The average precipitation was 0.53, or 0.12 below normal; the greatest monthly amount, 3.30, occurred at Lewers Ranch, and the least, trace, at several stations.

The weather conditions and pasturage were very favorable to stock interests.—*J. H. Smith.*

New England.—The mean temperature was 32.7°, or 4.4° below normal; the highest was 72°, at Flagstaff, Me., on the 1st, and the lowest, 9° below zero at Flagstaff on the 12th. The average precipitation was 2.20, or 1.72 below normal; the greatest monthly amount, 5.71, occurred at Enosburg Falls, Vt., and the least, 0.48, at Chatham, N. H.

Much cloudiness, although the precipitation for the month was below normal. In many sections the water is low in streams, springs, and wells, and rain is needed. The mean temperature was phenomenally low, making the coldest November for many years. A severe storm

passed over the district on the 24-25th, accompanied by high and destructive winds and heavy precipitation. Generally speaking, November was an unpleasant month.—*J. W. Smith.*

New Jersey.—The mean temperature was 38.5°, or 5.0° below normal; the highest was 69°, at Egg Harbor City and Toms River on the 1st, and at Cape May C. H. and Tuckerton on the 2d, and the lowest, 10°, at Chester on the 29th and at Toms River on the 21st and 29th. The average precipitation was 2.38 or 1.61 below normal; the greatest monthly amount, 4.23, occurred at Moorestown, and the least, 1.18, at South Orange.—*Laura M. Dey.*

New Mexico.—The mean temperature was 46.4°, or 2.9° above normal; the highest was 87°, at Carlsbad on the 24th, and the lowest, 11°, at Springer on the 4th. The average precipitation was 1.37, or 0.54 above normal; the greatest monthly amount, 6.15, occurred at Roswell, and the least, 0.01, at San Marcial.

The warm weather and absence of severe frosts made the month unusually favorable for grazing interests.—*R. M. Hardinge.*

New York.—The mean temperature was 32.6°, or 4.7° below normal; the highest was 71°, at Romulus on the 2d, and the lowest, 14° below zero, at Jay on the 29th. The average precipitation was 2.74, or 0.22 below normal; the greatest monthly amount, 7.52, occurred at Number Four, and the least, 0.29, at Catskill.

The first of the month was dry, with moderate temperature, followed by much snow and very cold weather, the month being the coldest November in fourteen years. Grain in the interior of the State is well protected, the depth of snow ranging from 2 inches in the south to 2 feet in parts of the northern section. The weather was favorable for winter grain, which is in good condition, but backward.—*R. G. Allen.*

North Carolina.—The mean temperature was 43.8°, or 5.9° below normal; the highest was 83°, at Southern Pines on the 1st, and the lowest, 7°, at Linville on the 19th. The average precipitation was 1.28, or 1.98 below normal; the greatest monthly amount, 2.75, occurred at Currituck Inlet, and the least, 0.52, at Linville.

Very cold, dry weather prevailed during the month, which was, however, very agreeable for outdoor work on account of the large number of clear days. The mean temperature for the State at large is the lowest on record for November since 1872, and it was also the driest during the same period, with the exception of November, 1890. The prevailing drought delayed the seeding of winter wheat and oats; much wheat failed to germinate or perished for want of moisture, and consequently poor stands are generally reported. Indications point to an increased acreage. The weather was very favorable for gathering the last corn and cotton, and generally for all work except plowing, for which the soil is too dry and hard, but some damage by hessian fly was reported.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 26.8°, or 4.4° above normal; the highest was 70°, at Medora on the 1st, and the lowest, 7° below zero, at McKinney on the 4th. The average precipitation was 0.19, or 0.51 below normal; the greatest monthly amount, 1.02, occurred at Williston, and the least, trace, at Amenia, Cando, Devils Lake, Dunseith, Grafton, Hannaford, Melville, and Willow City.

The month was warm and dry, being very favorable for stacking late-cut hay and for thrashing, of which latter considerable remained unfinished. The absence of snow on the ground allowed stock to pasture on the ranges during the entire month.—*B. H. Bronson.*

Ohio.—The mean temperature was 37.7°, or 3.1° below normal; the highest was 79°, at Sidney on the 1st and at Rittman on the 11th, and the lowest, 10°, at Celina on the 5th and at Bangorville and Rocky Ridge on the 28th. The average precipitation was 1.54, or 1.79 below normal; the greatest monthly amount, 4.24, occurred at Hillhouse, and the least, 0.55, at Jacksonboro.

Wheat made but little progress during the month. It is small and backward in the southern section; somewhat more promising in the middle section, and from fair to good in the northern section. Rye is in fair condition in the north, but poor in the south. Corn husking has progressed slowly but it is not completed. The water supply is very low.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 51.4°, or 2.7° above normal; the highest was 89°, at Fort Sill on the 1st, and the lowest, 18°, at Blackburn, Ind. T., on the 16th, and Jenkins, Okla., on the 23d. The average precipitation was 1.34, or 0.27 below normal; the greatest monthly amount, 5.10, occurred at Tahlequah, while none fell at Woodward.

The weather during the month was generally dry, with moderate day and cool night temperatures; drought conditions were prevalent, and wheat deteriorated to some extent; generally, the crop continued in fair condition, but needed a soaking rain to advance its growth and supply subsoil moisture. Stock is still pasturing, generally on wheat, and was in fairly good condition at the close of the month, with water very scarce.—*Charles M. Strong.*

Oregon.—The mean temperature was 46.5°, or 3.2° above normal; the highest was 78°, at Junction City on the 4th, and the lowest, 8°, at Beulah and Vale on the 11th. The average precipitation was 5.09, or 1.68 below normal; the greatest monthly amount, 8.10, occurred at Glenora, and the least, 0.15, at Prineville.

The month was unusually mild throughout, the fall rains beginning

later than usual. Farm work in the western section of the State was well advanced at the close of the month and fall grain looked thrifty and promising. In the eastern section the dry weather retarded farm work to some extent. In the latter named district early sown fall grain came up unevenly, but the recent rains will greatly benefit it.—*Edward A. Beals.*

Pennsylvania.—The mean temperature was 36.0°, or 4.5° below normal; the highest was 76°, at California on the 1st, and the lowest, 7°, at Center Hall on the 27th. The average precipitation was 2.56, or 1.00 below normal; the greatest monthly amount, 5.00, occurred at Warren, and the least, 1.23, at Wilkesbarre.

Conditions were favorable during most of November for husking corn and securing late crops. The protracted drought delayed plowing somewhat and in some sections injuriously affected the germination of late sown grain and retarded the growth of the early sown. Much of the former was purposely delayed to avoid the hessian fly. The early seeded grain has a healthy appearance and a good stand. Some late fields look bare and thin. The rains during the middle and latter part of the month will be beneficial to grain and grass and have filled up the springs and streams, some of which had become very low.—*T. F. Townsend.*

Porto Rico.—The mean temperature was 76.8°, or 0.8 below normal; the highest was 96°, at Cayey on the 8th, and the lowest 55°, at Adjuntas on the 30th. The average precipitation was 13.62, or 4.11 above normal; the greatest monthly amount, 21.57, occurred at Barros, and the least, 4.11, at Guayama.

The weather during most of the month was decidedly unfavorable for farm work and for all crops except cane. Tobacco beds were badly damaged and some small crops, such as beans, frijoles, etc., completely destroyed. Coffee picking was practically finished, though some difficulty was experienced in cleaning and preparing the berries for market, owing to a lack of sunshine. There was a marked increase in preparations for the new tobacco crop. There was a general scarcity of minor fruits and ground provisions throughout the island. Pastures and stock continue in excellent condition.—*E. C. Thompson.*

South Carolina.—The mean temperature was 48.2°, or 6.0° below normal; the highest was 85°, at Blackville and Temperance on the 1st, and the lowest, 17°, at Walhalla on the 16th, Seivern on the 18th, and Lugoff on the 29th. The average precipitation was 1.01, or 1.84 below normal; the greatest monthly amount, 3.10, occurred at Georgetown, and the least, 0.36, at Walhalla.

The first general killing frost occurred on the 7th, which ended the growing season. The weather, while cool, was favorable for gathering crops, especially cotton, not all of which was picked by the close of the month. The ground was too dry for working well and for favorable germination of wheat and oats. Clay lands were unfit to plow or seed. Along the coast the drought increased in severity and has become alarming, having practically ruined fall and winter truck crops. Wheat seeding has only fairly begun.—*J. W. Bauer.*

South Dakota.—The mean temperature was 34.1°, or 5.0° above normal; the highest was 78°, at Bowdle on the 1st and at Bad Nation on the 10th, and the lowest, 6° below zero at Grand River School on the 7th. The average precipitation was 0.30, or 0.29 below normal; the greatest monthly amount, 1.12, occurred at De Smet, and the least, trace, at Alexandria and Marion.

The month was unusually free from storms, marked cold waves, or heavy snowfalls, and the conditions were generally highly favorable for the completion of autumn, field, and other farm work, and the uninterrupted feeding of live stock on the range. On the whole it was a very pleasant and favorable month.—*S. W. Glenn.*

Tennessee.—The mean temperature was 44.1°, or 3.6° below normal; the highest was 78°, at Tellico Plains on the 1st, and the lowest, 11°, at Rugby, Hohenwald, and Johnsonville on the 17th. The average precipitation was 1.43, or 2.24 below normal; the greatest monthly amount, 2.90, occurred at Tullahoma, and the least, 0.11, at Lynnville.

The month was very dry, cool, and favorable for farm work, which was well advanced at the close of the month. Wheat sowing was nearly finished, though there was some delay through fear of fly; early sowings were up and looking well, with good stands, but growth checked by dry, cool weather; acreage was increased in most sections and the crop put in better than usual. Other winter grains were looking well.—*H. C. Bate.*

Texas.—The mean temperature was 59.0°, or 2.4° above normal; the highest was 94°, at Fort Ringgold on the 1st and 2d and at Jasper on 1st, and the lowest, 19°, at Tyler on the 21st. The average precipitation was 1.63, or 0.51 below normal; the greatest monthly amount, 4.84, occurred at Longview, while none fell at Fort Stockton.

In the west-central counties and along the Rio Grande the prolonged drought continues unbroken, and has become one of great severity. Fall plowing and seeding have progressed under favorable conditions, except where too dry, and the greater part of the latter work has been completed. Where the moisture has been sufficient wheat is up to good stands and making a fine growth, and in some sections the fields are being pastured. From regions where the soil is very dry complaints are made of poor stands and ungerminated seed. General

rains would greatly benefit the condition of wheat and other fall grain. Cotton picking has been completed in all sections, except for small scattered patches.—*Edward H. Bowie.*

Utah.—The mean temperature was 41.3°, or 4.0° above normal; the highest was 76°, at Green River on the 1st, St. George on the 3d and 4th, and at Fillmore on the 8th; and the lowest, zero, at Loa on the 11th. The average precipitation was 0.29, or 0.55 below normal; the greatest monthly amount, 1.40, occurred at Heber, while none fell at ten stations.

One of the warmest Novembers on record. The continued dry weather has not been favorable for fall grain. Feed and water are very scarce on the ranges, and as a result sheep are in very poor condition.—*L. H. Murdoch.*

Virginia.—The mean temperature was 41.2°, or 5.6° below normal; the highest was 84°, at Barboursville on the 1st, and the lowest, 11°, at Buckingham and Burkes Garden on the 19th. The average precipitation was 1.48, or 1.31 below normal; the greatest monthly amount, 2.62, occurred at Lincoln, and the least, 0.20, at Newport News.

The month was too cold and dry for the growth or the early seeding of winter grains, also for the germination of late seeding. Many fields seeded to winter wheat late in the season are still bare, and it is thought the seed has rotted. Winter oats and clover behind their average seasonal condition. Fall plowing suspended until after rains of 23–24th.—*Edward A. Evans.*

Washington.—The mean temperature was 44.0°, or 3.3° above normal; the highest was 77°, at Mottinger's on the 4th, and the lowest, 9°, at Wilbur on the 3d. The average precipitation was 6.10, or 0.36 above normal; the greatest monthly amount, 23.68, occurred at Clearwater, and the least, 0.35, at Connell.

The mildness of the month, and sufficiency of rain contributed to the growth of winter wheat, which throughout the month was in very favorable condition.

The rain improved pastures and put the soil in good condition for plowing.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 38.0°, or 6.2° below normal; the highest was 79°, at Mannington on the 1st, and the lowest, 7°, at Beverly on the 29th. The average precipitation was 2.51, or 0.63 below normal; the greatest monthly amount, 5.35, occurred at Mannington, and the least, 1.23, at Lewisburg.

At the close of the month, early sown wheat, where not injured by the fly, was in fair condition, but the later sown (and most was such) was in rather poor condition, and some had been killed.—*E. O. Voss.*

Wisconsin.—The mean temperature was 32.0°, or 0.5° below normal; the highest was 73°, at Prairie du Chien on the 12th, and the lowest, 8° below zero, at North Crandon on the 26th. The average precipitation was 0.84, or 0.90 below normal; the greatest monthly amount, 1.87, occurred at Osceola, and the least, 0.22, at Prentice.

The weather during the month was very favorable for winter grains and grasses. Winter wheat and rye have continued to make good progress and are now generally considered to be in excellent condition. The deficiency in precipitation has caused a low stage of water in most streams, and the soil, especially in the southern portion of the State, is in need of moisture.—*W. M. Wilson.*

Wyoming.—The mean temperature was 37.1°, or 4.7° above normal; the highest was 82°, at Bitter Creek on the 9th, and the lowest, 8° below zero, at Big Piney on the 13th, 18th, and 19th. The average precipitation was 0.32, or 0.31 below normal; the greatest monthly amount, 1.25, occurred at Fort Yellowstone, while none fell at Hyattville.

The month was unusually mild and free from any severe storm. The weather was very favorable for all stock, which is still in excellent condition. The absence of snow prevented many sheep from being moved to winter ranges away from the streams, and compelled them to be fed on the summer ranges, which now furnish poor grazing.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

THE WESTWARD MOVEMENT OF THE DAILY BAROMETRIC WAVE.¹

By OLIVER L. FASSIG, Ph. D., Section Director, United States Weather Bureau.

The publication, in recent Annual Reports of the Chief of the Weather Bureau, of the hourly values of barometric pressure at a large number of stations in the United States, in the West Indies, and along the north coast of South America affords an excellent opportunity for the study of the diurnal variations of the barometer over a wide area. Reliable hourly observations in the middle and higher latitudes of South America are still few in number. However, by selecting for study the month of July, during which the heat equator is thrown farthest to the north, this lack of data in the Southern Hemisphere is largely remedied. During July there is a nearer approach to similarity in the distribution of land and water to the north and south of the heat equator; hence the conditions which largely influence temperature and pressure changes are more nearly comparable in the Western Hemisphere than they are over the Eastern Hemisphere, where the northern half is mostly land and the southern mostly water.

Until recently the question of the diurnal variation of the barometer has been studied mostly by means of the diurnal curve at isolated stations. In the present treatment of the subject the hourly values, or rather the hourly departures from the average for the day, at about 50 stations have been charted, after being reduced to a common hour, namely, seventy-fifth meridian time. In this way we obtain a view of actual conditions of pressure at the same instant of time over a wide area, similar to that of our daily simultaneous weather charts. Charting the observations in this manner brings to light some relations hitherto but vaguely recognized in the theoretical discussions of the subject.

On the accompanying Charts X–XIII, figs. 1–24, I have plotted the departures from the average daily pressure for

each hour of the day and night at stations in North and South America and in the West Indies, together with a few outlying stations. Lines were then drawn connecting stations having equal departures from the accepted normal value for the day, i. e., hourly isobnormals of pressure. The area covered by the observations extends in longitude from 0° to 140° west of Greenwich; in latitude, from 60° north to 40° south.

Taking up the charts in the order of time, the three most striking features within the area of observation are:

(a) The development and westward propagation of an area of pressure above the normal, an anticyclonic area, or perhaps more properly a wave of increasing pressure, over the North and South American continents during the forenoon; followed by,

(b) The development and westward propagation of an area of pressure below the normal value, or a wave of diminishing pressure during the afternoon; followed by,

(c) A period of comparatively uniform distribution of pressure during the night hours, which, upon further study, may be subdivided into two minor periods, namely, a secondary period of high pressure during the first half of the night, followed by a secondary period of low pressure during the second half of the night.

A closer study of the charts under consideration reveals the following characteristics of the principal and the secondary systems of isobnormals.

(1) The principal area of high pressure.

The area of pressure above the normal of the day appears upon the eastern coast of the United States between 5 and 6 a. m. It increases in extent and strength to 11 a. m. (seventy-fifth meridian), when it reaches a maximum, in July, of about + 0.040 inch over the United States, and of + 0.020 inch over the Gulf of Mexico and the West Indies. Over the South American Continent a maximum of + 0.040 inch is reached about an hour earlier. At the time of maximum development it extends from about 20° to 140° longitude west of Greenwich, and from about 70° north to 60° south latitude, the axis of

¹Read before the Milwaukee Convention of United States Weather Bureau Officials, August 27, 1901.